<u>In the Claims</u>

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1. (currently amended) A method for rapid thermal processing (RTP) of a substrate used to make semiconductor devices comprising the steps of:

forming a hot gas stream whose temperature is substantially above a peak substrate surface temperature obtained during thermal processing of the substrate by the hot gas stream ~~;~~ and the power density of the hot gas stream ... claim 13
and

<u>effectively</u> moving a substrate through the hot gas stream at a speed selected to treat an area of the surface of the substrate at a high peak temperature while establishing a temperature differential throughout the thickness of the substrate to enable the substrate to produce enhanced cooling of a treated area of the substrate by thermal conduction into the bulk of the substrate after the treated area has passed out of the hot gas stream, wherein the treated area cools at a rate of at least 10^3 °C/sec.

2. (previously amended) The method as claimed in claim 1 wherein the power density of the hot gas stream is above about 5×10^7 W/m^2.

3. (currently amended) The method as claimed in claim 1 wherein the exposure time t_E of said treated area of the substrate to the hot gas stream is less than <u>10 ms</u> and <u>determined by</u> a value given by <u>an</u> ~~the~~ expression~~:~~ <u>wherein t_E is dependent upon the substrate density, ρ, substrate heat capacity, c_p, substrate thickness, Δh, and substrate thermal conductivity, k</u> ~~< ~0.4ρ c_pΔh^2 / k~~.

4. (original) The method as claimed in claim 1 wherein the velocity of the substrate relative to the hot gas stream is above about 1.0 m/sec.

5. (previously amended) The method as claimed in claim 1 for a silicon substrate wherein the velocity of the substrate is selected sufficiently high to yield an exposure time of any treated area on the substrate to the hot gas stream of less than about 8ms.

6. (original) The method as claimed in claim 2 wherein the velocity of the substrate is above about 1.5 m/sec.

7. (currently amended) The method as claimed in claim 1 wherein said substrate is held in a substrate holder of the non-contact vortex type and wherein said substrate holder has an extension beyond the substrate edge, said extension extending out from the substrate for a distance greater than the characteristic width of the hot gas stream treatment area.

8. (original) The method as claimed in claim 1 and further including the step of doping of the semiconductor substrate by annealing of the crystal damage from a previous implantation of doping atoms.

9. (original) The method as claimed in claim 1 and further including the step of diffusing doping atoms from a layer deposited over the substrate.

10. (previously amended) The method as claimed in claim 1 and further including the step of diffusing doping atoms from the hot gas stream wherein a material containing the doping atoms was injected into the hot gas stream.

11. (Currently amended) A method for rapid thermal processing (RTP) of a substrate used to make semiconductor devices comprising the steps of:

forming an atmospheric arc-type hot plasma stream whose power density is above about $5x10^7$ W/m^2 and has a cross-sectional area that is substantially less than the surface area of the substrate to be treated by the hot gas stream; and

moving a substrate through the hot gas stream with a predetermined controlled pattern and at a speed that is above a threshold level selected to treat a surface of the substrate at a high temperature while preserving a temperature differential throughout the thickness of the substrate to significantly contribute to a cooling of a treated area of the substrate after the treated area has passed out of the hot atmospheric gas stream.

12. (original) The method as claimed in claim 11 wherein said threshold level is at about 1.5 m/sec.

13. (original) A method for rapid thermal processing (RTP) of a substrate used to make semiconductor devices comprising the steps of:

forming a hot gas stream whose power density is sufficiently high to increase the surface temperature of the substrate at a rate in excess of about 10^3 °C/sec; and

moving a substrate through the hot gas stream at a speed selected to treat the surface of the substrate at said high temperature while preserving a temperature differential throughout the thickness of the substrate and enable the substrate to cool the treated area at a rate of at least about 10^3 °C/sec after the treated area has passed out of the hot gas stream.

14. (original) The method as claimed in claim 13 wherein said hot gas stream has a power density that is sufficiently high to raise the temperature of the surface of the substrate to above about 1000 °C during movement of the substrate relative to said hot gas stream without permanent deformation of the substrate and without introducing crystal defects into the substrate.

15. (original) The method a claimed in claim 14 wherein the power density of the gas stream is above about $5x10^7$ W/m^2.

16. (original) The method as claimed in claim 13 wherein said hot gas stream has a power density that is sufficiently high to raise the temperature of the surface of said substrate along a path to a level at which a shallow segment of the substrate melts along said path.

17 (original) The method of claim 13 wherein the motion of said substrate is controlled so as regulate the peak temperature of the surface of the substrate.

18. (previously amended) The method of claim 1 wherein said movement of the substrate is controlled to provide multiple overlapping passes with sufficient intervals between adjacent passes to enable a portion of the substrate exposed to the hot gas stream during a previous pass to cool to a desired level for a generally uniform thermal treatment of the entire substrate while establishing said temperature differential.

19. (previously amended) The method as claimed in claim 1 wherein said substrate has a motion configuration wherein the substrate moves through the hot gas stream with a step and scan motion such that the substrate moves with sequential, off-set passes through the hot gas stream with a controlled velocity along linear paths.

20. (previously amended) The method as claimed in claim 1 wherein said substrate has a motion configuration wherein the substrate moves through the hot gas stream with a step and scan motion such that the substrate moves with sequential, off-set

passes through the hot gas stream with a controlled velocity along paths that are arcuate.

21. (previously amended) The method as claimed in claim 13 wherein the motion of the substrate is along overlapping scans while providing a cool-down time between scans with scans which are off-set from each other where:

scans in each set are greater in dimension than the characteristic width of the hot gas treatment area;

subsequent sets of scans are offset by sufficiently small steps to give uniform treatment and

sets of scans are run to fully treat the entire substrate.

22. (previously amended) A substrate etching method for removing a polymer from a substrate having high depth to width aspect ratio holes, comprising the steps of:

directing an atmospheric plasma hot gas having a heat flux in the range from 10^6 to 10^7 W/m^2 for a controlled rapid removal of a polymer from a high depth to width ratio hole in the substrate and varying the exposure time of the substrate to the hot gas to obtain a uniform net removal of polymer material from high depth to width aspect ratio holes in the substrate.